Material Characterization and Electromagnetic Non-destructive Testing and Evaluation

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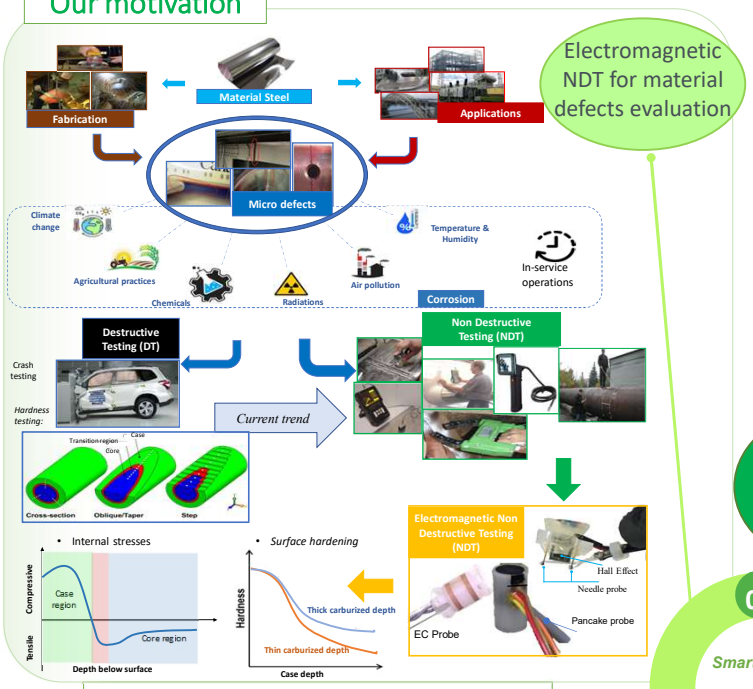
Executive Summary

Every engineering system experience significant performance depreciation in its service time till failure of essential parts. This drop in performance informs of the constant evolution of material microstructural parameters such as grains size, orientation, stress and strain fields, and eventually shapes the goals of the current emerging electromagnetic NDT methods towards material integrity challenges. The field of NDT is evolving. This evolution is related to the complexity of the components to be controlled and to the improvement of the instrumentation and the computing techniques. Eddy current testing (ECT), magnetic Needle Probe(MNP), Magnetic Incremental Permeability (MIP) and magnetic Barkhausen noise (MBN) are some examples of electromagnetic NDT methods with numerous applications in piping, aeronautics, electrical machinery, etc. Exploiting the magnetic behaviour of material steels is crucial for the accurate simulation of electromagnetic devices and eventually, an accurate prediction of their performances.

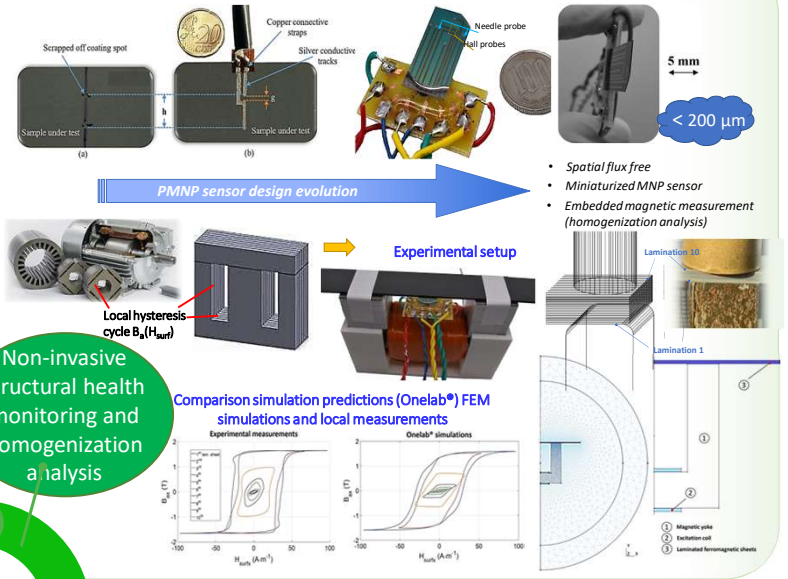
Our motivation



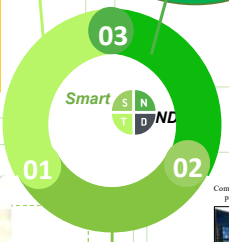
Electromagnetic NDT for material defects evaluation

Printed Magnetic Needle Probe (PMNP)

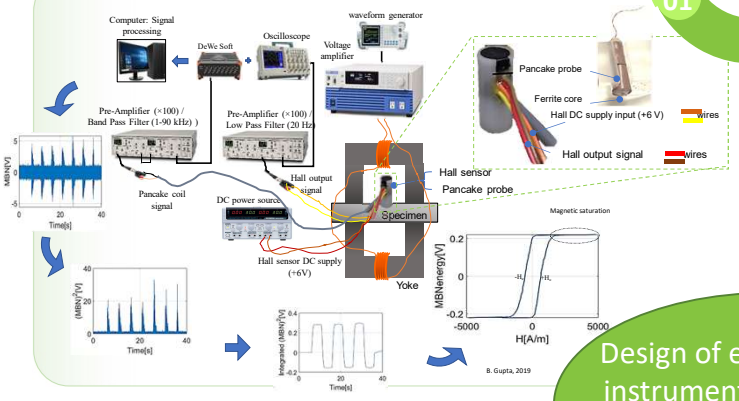
➢ ***Objectif***: *Internal characterization of a laminated magnetic core*



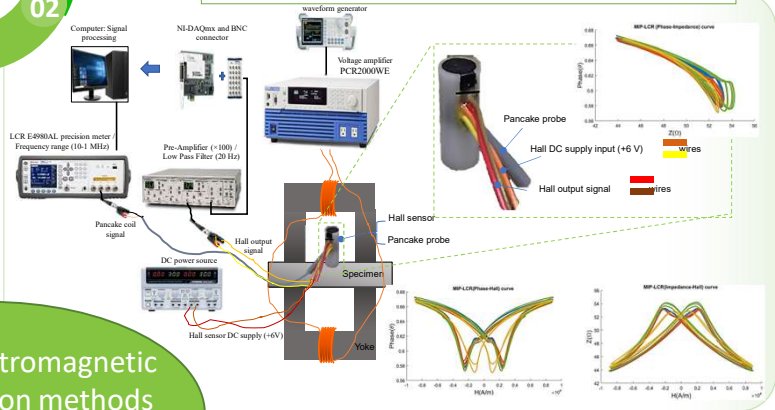
Non-invasive structural health monitoring and homogenization analysis



Magnetic Barkhausen Noise (MBN)

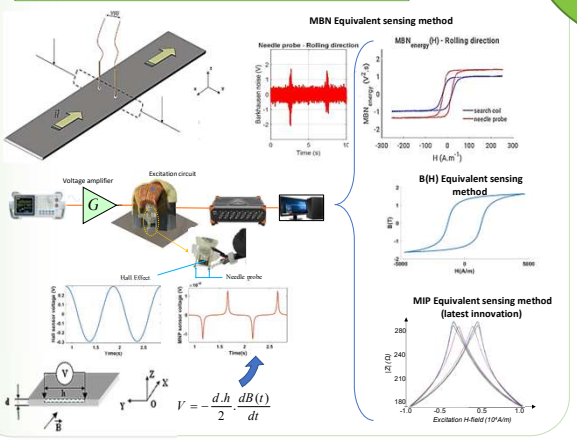


Magnetic Incremental Permeability (MIP)



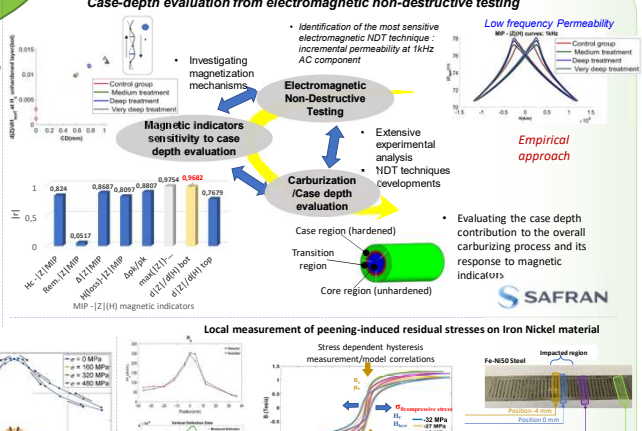
Design of electromagnetic instrumentation methods towards integrity evaluation of materials and systems

Magnetic Needle Probe (MNP)

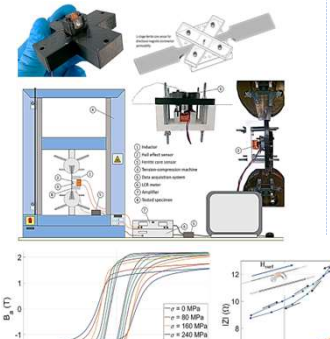


Smart NDT Applications

Case-depth evaluation from electromagnetic non-destructive testing



Characterization of Tensile Stress-Dependent Directional Magnetic Incremental Permeability in Iron-Cobalt



Local measurement of peening-induced residual stresses on Iron Nickel material

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